22. (Amended) The fully automated telescope system according to claim 21 further comprising:

means for defining a geographical [position of] indicia with respect to the telescope; and

[means for processing] wherein the command module processes the geographical [position] indicia, the determined horizontal aspect and the determined vertical aspect of the telescope in order to orient the telescope with respect to a celestial coordinate system.

REMARKS

Claims 6-14 and 20-24 are in Application, with Claims 6, 7, 8, 10, 11, 14, 20, 21 and 22 having been amended. Of the claims under consideration, Claims 6 and 20 are the independent claims. Reconsideration and further examination are respectfully requested.

Initially, the abstract was objected to as not having been submitted on a separate sheet of paper. In response, Applicants submit herewith a substitute abstract, on a separate sheet of paper, in accordance with 37 C.F.R. 1.52(b)(1). Entry is respectfully solicited.

The drawings were objected to as failing to comply with 37 C.F.R. 1.84(p)(4) and (5), for various informalities. In response, Applicants respectfully submit herewith proposed changes to FIGs. 3a, 3b and 5bin order to correct the multiplicity of references designated by numeral "48". With regard to reference numerals 71, 89 and 95, Applicants have amended the specification in order to directly identify the structure associated with numerals 71 and 89 and propose to delete numeral 95 from FIG. 5b. Applicants therefore submit that the drawing informalities have been corrected and request acceptance of the proposed drawing changes.

Claim 14 was rejected under 35 USC Section 112, second paragraph, for indefiniteness as improperly depending from a preceding dependent claim. Applicants have amended Claim 14 to

have it depend from Claim 12, as opposed to Claim 13. Applicants submit that the indefiniteness of dependent Claim 14 has been resolved and would respectfully request reconsideration and withdrawal of the rejection of Claim 14 under 35 USC Section 112, second paragraph.

Claims 20-24 were rejected under 35 USC Section 102(b) as anticipated by U.S. Patent No. 4,682091 to Krewalk. In giving the rejection, the Examiner asserts that the Krewalk reference discloses all of the features of the claimed invention, even with respect to the claimed elements of dependent Claims 21-24. Applicants respectfully traverse this rejection.

In particular, and with regard to the automated telescope system of Claim 20, the invention is directed to a telescope system having attributed intelligence in that command, control and information processing functions are rationally allocated between and among a central command unit and an intelligent motor portion. The intelligent motor portion includes an electric motor coupled to one of two substantially orthogonal axes and an intelligent control circuit coupled to the motor, along with the position indication circuit coupled to the respective axis and to each intelligent control circuit. In accordance with the invention, the intelligent motor control circuit independently develops motor movement commands and operative response to position indication signals received from the position indication circuitry and to telescope positioning commands received from the central control processor.

The automated telescope system, with distributive intelligence, will be understood as including separate processor means, coupled to each motor, which control the entire functionality of that motor. The motor processor means (first processor means) receives only high-level telescope positioning commands from a command unit (a command module) and controls the entire operation of the motor by evaluating position indication signals received from position indication means. The command processor is, therefore, free to process commands and data and need not be concerned with motor operation or evaluation of motor position indicators. This functionality is the responsibility of the intelligent motor processor.

Thus, as is set forth in independent Claim 20, a fully automated telescope system with functional intelligence distributed between intelligent components comprise an intelligent motor portion which includes first processor means for commanding a motor to rotate the telescope, a desire to mount about a respective access, and which further includes position indication means which develops position indication signals corresponding to the actual amount of rotation of the telescope about the axis. The motor processor commands motor movement in operative response to the position indication signals. A command module, including second processor means, translates the user input into telescope positioning signals suitable for transmission to the intelligent motor portion, the first processor means of the intelligent motor portion processing said positioning signals into motor motion commands. Thus, the intelligent motor portion controls operation of the motor and operative response to position indication feedback signals and telescope positioning commands received from a command module.

The art of record is not understood to disclose or suggest any of the foregoing, and, particularly, is not understood to disclose or suggest the distributed processor functionality (intelligence) of the novel automated telescope system.

Specifically, Krewalk in FIG. 8, and throughout the specification of the 091 patent. The 091 patent is concerned with a computer controlled telescope system having a single microprocessor kernel 180 which controls the entire functioning of the apparatus.

It is of particular note that the apparatus disclosed in the 091 patent depends upon stepper motors (74 and 144 of FIG. 8) as the motive means for rotating the telescope about its respective axes. It is well understood by those having skill in the art that stepper motors operate by having a microprocessor, such as microprocessor kernel 180, continually issue motor movement commands in the form of "step pulses" during the entire period that the motor is operating. At any time, that the microprocessor ceases issuing motor movement commands, the stepper motors cease to step and the telescope ceases to move. Accordingly, it is not physically possible for the microprocessor kernel 180 of the apparatus of the 091 patent to issue a telescope positioning

command to an intelligent motor control processor and then turn its attention elsewhere, leaving the intelligent motor processor to actually command motor movement.

Further, as set forth in independent Claim 20, the automated telescope system according to the invention requires position indication means which develop position indication signals that inform the intelligent motor control processor (first process means) as to the actual arcuate position of its respective telescope axes. The first processor means commands a motor to rotate the telescope a desired arcuate amount about a respective axis and the position indication means determine the arcuate amount of rotation.

Nothing in the 091 patent is understood to disclose or suggest this particular feature. Specifically, and as mentioned above, the 091 patent relies upon the use of stepper motors to effect telescope rotation. To effect a large telescope movement, a series of stepper pulses (1 million, for example) are issued to a stepper motor without regard as to how many steps the stepper motor actually took. It is assumed that since 1 million pulses were issued, 1 million steps were taken. There is no disclosure or suggestion of any apparatus or structure in the 091 patent that can verify that the stepper motor even received the 1 million pulses, much less than it moved to 1 million steps, and even less that the telescope access was actually deflected in the desired amount.

Looking particularly at FIG. 8 of the Krewalk reference, only one processor is shown, i.e., microprocessor kernel 180. FIG. 8 of the Krewalk reference shows two stepper motors, 74 and 144, with each stepper motor being directly coupled to the microprocessor kernel 180 by its own signal line. No further processors are interposed between Krewalk's motors and Krewalk's single microprocessor kernel 180. Thus, Krewalk does not show a motor portion including first processor means, with the first processor means being separate and distinct from the processor means of the command module.

Krewalk does not disclose position indication means, much less position indication means included within a motor portion, intelligent or otherwise.

Since Krewalk only discloses a single microprocessor kernel 180, it cannot be construed and disclosing first and second processor means. Since the first and second processor means are not present in Krewalk, it is not understood how it is possible for Krewalk to disclose a communication bus connecting first and second processor means.

Inasmuch as Krewalk does not disclose the essential and primary elements of the invention as set forth in independent Claim 20, i.e., Krewalk does not disclose an intelligent motor portion including separate processor means for commanding a motor to rotate the telescope in response to position indication signals developed by position indication means, a separate command module including second processor means for translating a user input into telescope positioning signals suitable for transmission to the intelligent motor module and a communication bus coupled there between, Applicants would respectfully submit that the Krewalk reference is inappropriate for supporting an anticipation rejection under 35 USC 102(b).

Reconsideration and withdrawal of the anticipation reference under 35 USC 102(b) is solicited.

Turning now to dependent Claim 31, the fully automated telescope system according to the invention further comprises first and second means for determining an initial horizontal and vertical aspect to the telescope wherein those means provide signals corresponding to each determined initial aspect to the command module.

Applicants wish to remind the Examiner that claims drawn in conformance with 35 USC Section 112, paragraph 6, must be examined in accordance therewith. Accordingly, the first and second means for determining an initial horizontal and vertical aspect of the telescope must be construed in accordance with the corresponding structure set forth in the specification that accommodates the function provided for in the claims.

In accordance with the invention, the user need only establish the telescope upon its tripod without regard to any particular spatial orientation thereof. The user then merely commands the telescope to rotate horizontally until the telescope is positioned with respect to a particular horizontal aspect, i.e., the telescope is pointed generally north, generally south, or pointed in a direction which is determinable with respect to a geographical compass coordinate such as north, south, or the like. The user then commands the telescope to move in a vertical direction so as to position the telescope with respect to a vertical aspect such as towards the horizon, or a vertical aspect which is determinable with respect to a vertical coordinate, such as the horizon. The means for establishing these initial aspects of the telescope are fully set forth in the specification of the application, and include the first and second processor means and the position indication means set forth in independent Claim 20. In effect, the user commands the telescope to rotate horizontally until such time as the telescope is pointing in a specific, determinable direction. The user tells the command module in which direction to move, the command module informs the intelligent motor module how to proceed, the intelligent motor module provides the specific motor commands to the motor, the position indication means indicating when the motor has rotated the telescope to the user desired position.

Movement of the telescope to the desired vertical aspect follows precisely the same procedure and involves precisely a similar circuitry, that circuitry coupled to the axis controlling vertical motion as opposed to corresponding circuitry controlling horizontal motion.

The Examiner has alleged that the Krewalk apparatus discloses first and second means for determining a horizontal and vertical aspect of the telescope and has identified said means as items 208 and 206, respectively, of FIG. 8 of the Krewalk reference. Applicants respectfully disagree.

Items 206 and 208 of the Krewalk reference refer to sensors which identify an initial positioning reference of the Krewalk telescope by interaction with an occulting disc fin. The Krewalk disc fin is a structure that is affixed to the telescope axes in a permanent position which

requires the telescope to be manually positioned and adjusted such that the Krewalk reference marks are positioned in the desired location. The Krewalk sensors 206 and 208 merely indicate when the Krewalk axes are in the initial position, but can do nothing more to determine any subsequent positioning of the telescope in either a horizontal or vertical aspect.

In contrast, the invention provides for means to determine the horizontal and vertical aspect of a telescope, without regard to the telescope's tripod setup. The motor processors and position indication circuitry determine the initial aspect of the telescope and provide signals corresponding to the determined aspect to the command module. This is done without regard to any mechanical initialization reference as required by Krewalk.

With regard to dependent Claim 22, Applicants would again wish to note that the structure set forth in the specification which performs the required functions set forth in this claim is in no way similar to the Krewalk apparatus. Krewalk requires that latitude and longitude information might be derived from a map, or some other external structure, and entered as data into a personal computer which transfers that data to Krewalk's microprocessor kernel 180.

In contrast, the invention provides for a databases contained within the command module which includes a list of geographical indicia relevant to telescopes setup. When the relevant geographical indicia is chosen by the user, the command module processes that information, along with the horizontal and vertical aspect data so as to orient the telescope with respect to a celestial coordinate system.

Krewalk does not disclose this structure. Indeed, Krewalk discloses additional and substantially different structure, i.e., a personal computer through which manual data entry is effected.

These same considerations apply to dependent Claims 23 and 24, which refer to particular structure set forth in the specification for selecting desired celestial objects and for

REMARKS

Claims 54-96 are in the application, with claims 6-14 and 20-24 having been cancelled. Claims 1-5 were cancelled in Applicant's response, dated August 11, 2000 and claims 15-19 and 25-53 were cancelled in Applicant's Preliminary Amendment dated April 18, 2000. Of the claims under consideration, claims 54, 61, 69, 75, 77, and 89 are the independent claims. Reconsideration and further examination are respectfully requested.

Initially, Applicants wish to express their appreciation to the Examiner for the interview of March 27, 2001, which gave Applicants the opportunity to demonstrate the various features of a novel telescope system embodying many aspects of the inventions contained within added claims 54-96.

Original claims 6, 7, 8 and 20 were rejected under 35 U.S.C. § 103 for obviousness over U.S. Patent No. 4,682,091 to Krewalk et al. in view of U.S. Patent No. 5,882,116 to Leblanc. Applicants respectfully traverse this rejection.

At the interview, Applicants and the Examiner discussed the advantages of the present invention, including, for example, the advantages of the distributed intelligence illustrated by the demonstrated embodiment and the ability of the demonstrated embodiment to allow an amateur, or someone who has no knowledge of the night sky, to acquire, track and view celestial objects with much of the same flexibility and facility as an experienced astronomer. In particular, Applicants discussed with the Examiner the advantages of the demonstrated embodiment's distribution of processing intelligence between a command processor, which carries out a number of computationally intensive tasks, and motor control processors. In the demonstrated embodiment, the command processor computes celestial object location, automatically selects orientation stars which

are above the user's horizon, calculates dynamic movement profiles for axial movement of an alt-azimuth telescope system so as to track both sidereal and non-sidereal object motion, and delivers appropriate motor movement commands to the motor control processors. Those processors, in turn, perform time-intensive and sometimes continuous operations needed to operate the telescope's axial motors to position the telescope where the command processor desires. As Applicants discussed with the Examiner, this distributed intelligence architecture offers significant advantages over prior-art type telescope systems that relied on a single microprocessor controlled command unit for all of their processing, including both computationally intensive tasks and generation of all commands needed to operate the systems' motors. Reducing the demands on the command processor enhances its ability to efficiently perform complex computational tasks, while the motor control processors, which need not perform the complex tasks allocated to the command processor, are able to control motion of the telescope about their respective axes with enhanced efficiency and refinement.

not unexpected

In the example provided in present claim 54, an embodiment of the invention consists of an automated telescope system of the type including a telescope mounted for rotation about two substantially orthogonal axes, the automated telescope system comprising first and second motor portions, each coupled to rotate the telescope about a respective one of the axes. Each motor portion includes a motor having a rotatable shaft; an incremental encoder coupled to the motor shaft, the encoder outputting signals corresponding to an amount of movement of its respective motor; and

an intelligent motor control processor, coupled to receive encoder signals from a respective incremental encoder, the intelligent motor control processor calculating and outputting motor control commands in operative response thereto. The automated telescope system further comprises

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a command processor operatively coupled to the motor portions, the command processor receiving an input representing a position of a desired viewing object, the position characterized in terms of a celestial coordinate system, the command processor further receiving an input representing a present position of the telescope, the telescope position characterized in terms of a rectangular coordinate system, the command processor calculating a rotational movement about each of the respective axes to move the telescope from its present position to the position of the desired viewing object and outputting each axial rotational movement to a respective motor control processor as motor movement commands. Each motor control processor translates received motor movement commands into motor control commands, each motor control processor commanding motor movement and receiving encoder signals corresponding to actual motor movement, the motor control processor processing received encoder signals to calculate an actual extent of motor movement.The art of record is not understood to disclose or suggest the foregoing combination of elements.The Examiner has cited Krewalk as disclosing certain elements, but has conceded that Krewalk does not disclose each motor portion having its own intelligent motor controller.

Leblanc is not understood to disclose or suggest anything that would remedy this deficiency in the Krewalk reference. While the Examiner has indicated that Leblanc suggests that it would have been obvious to have the motor portions of Krewalk each have their own intelligent motor control processors, Applicants respectfully disagree. As indicated in Column 4 at Lines 38-47 of Leblanc, the Leblanc servo control loops 101 and 102 function only to compare signals from respective sensors 100 and 103 with set point values to keep an electromagnetic motor centered on its travel in order that an auxiliary mobile assembly is slaved to and tracks the movement of the main mobile assembly. Leblanc's servo loops do not translate received motor movement commands into motor control commands and do not process received encoder signals corresponding to actual motor

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movement in order to calculate an actual extent of motor movement. For these and other reasons, Leblanc's servo loops do not provide the distributed intelligence called by the various elements of the present claims.

The Examiner has cited *Nerwin v. Erlichman*, 168 U.S.P.Q. 177, 179 (Bd. Pat. Inter. 1969), as holding that constructing a formerly integral structure in various elements involves only routine skill in the art. In fact, *Nerwin* contains no such holding. Rather, the case solely involved the sufficiency of support for an interference count, and the holding was that "[t]he mere fact that a given structure is integral does not preclude its consisting of various elements." *See id.* at 178-79. Further, the *Nerwin* case had nothing to do with distributed intelligence, processors, telescopes, or motors.

The obviousness of combining multiple references or modifying prior art cannot be assumed *a priori*, but must be demonstrated in the prior art. The addition of motor control processors as structures of an automated telescope system, and the addition of the required structures and processes for interaction between these new processors and a central control processor, constitutes significantly more than a mere rearrangement of parts, but even "[t]he mere fact that a worker in the art could rearrange the parts of the reference device to meet the terms of the claims . . . is not by itself sufficient to support a finding of obviousness. The prior art must provide a motivation of reason for the worker in the art, without the benefit of [the applicant's] specification, to make the necessary changes in the reference device." *Ex parte Chicago Rawhide Mfg. Co.*, 223 U.S.P.Q. 351, 353 (Bd. Pat. App. & Inter. 1984).

Thus, even if the cited references collectively disclosed all elements of Applicant's present claims – which they do not, for reasons including those stated above – Applicants respectfully submit that the Examiner has not satisfied her burden of showing a teaching or suggestion to combine the

no reason to combine

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references as proposed. *See In re Mayne*, 104 F.3d 1339, 1342 (Fed. Cir. 1997) ("When relying on numerous references or a modification of prior art, it is incumbent upon the examiner to identify some suggestion to combine references or make the modification."); MPEP § 2143.03 ("To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art."); *see also In re Dembiczak*, 175 F.3d 994, 999 (Fed. Cir. 1999) (stating that the showing of a suggestion, teaching, or motivation to combine "must be clear and particular"). In the absence of such a teaching or suggestion to combine the references, rejection of the present claims could be nothing more than an exercise in impermissible hindsight reconstruction.

hindsight

Notwithstanding the foregoing, none of the claimed embodiments of Applicants' invention are present in any prior-art telescope system of which Applicants are aware. Indeed, and as set forth in the accompanying Declaration of Secondary Considerations Under 37 C.F.R. 1.132, the invention has been considered so novel, by those having skill in the art, that the pertinent literature has characterized the telescope system which embodies it as being "revolutionary," "[T]he most significant advance in amateur astronomy for the last two generations" and "the greatest happening in amateur astronomy yet. Indeed, I believe it will grow the hobby on a scale heretofore unimagined." Thus, Applicants' invention has been widely recognized in the art as fulfilling a long-felt need and providing a significant advance in the field of amateur astronomy.

This paragraph does not correlate the point of novelty, different processors doing different things, with the secondary considerations.

Specifically, EDN magazine, a non-astronomical publication chose a telescope product embodying Applicants invention as meriting an award, and identified the synergy obtainable from "...a smart controller and a precision positioning system [as yielding] a new way of solving a long-standing setup problem". EDN magazine is particularly suited to discuss the novel processing features of the present invention, since the publication identifies itself as "The Design Magazine of the Electronics Industry". In this regard, the magazine noted "What's especially interesting is that

the design doesn't just add a smart control unit to the motion of the telescope axes; it tries to redo the way that the user works with a telescope while also using available processor power to overcome the inevitable mechanical deficiencies and calibration issues."

Additionally, Applicants' invention has been a notable commercial success. Indeed, since the introduction of products embodying Applicants' invention, the industry has witnessed the creation of a new market segment directed to such products, and has coined the term "Go To Telescopes" to refer to these products. Competitors have quickly copied Applicants' invention, taking advantage of Applicants' inventive efforts, and are presently exploiting the new market segment which was created as a result of those efforts.

Original claims 6, 7, 8, 9, 10, 11, and 12 were rejected under 35 U.S.C. § 112 for indefiniteness in references to "the intelligent." The present claims make it clear which motor control processor or processors are being referred to, obviating this basis for rejection.

In view of the foregoing, and the accompanying Declaration of Secondary Considerations, Applicants respectfully submit that claims 54-96 as presented contain patentable subject matter over any permissible combination of the cited art of record. Notification of allowance and early passage to issuance are respectfully requested.

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Respectfully submitted,

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JWE/mg

Approved
gw
3/9/04

attach #9 & 10

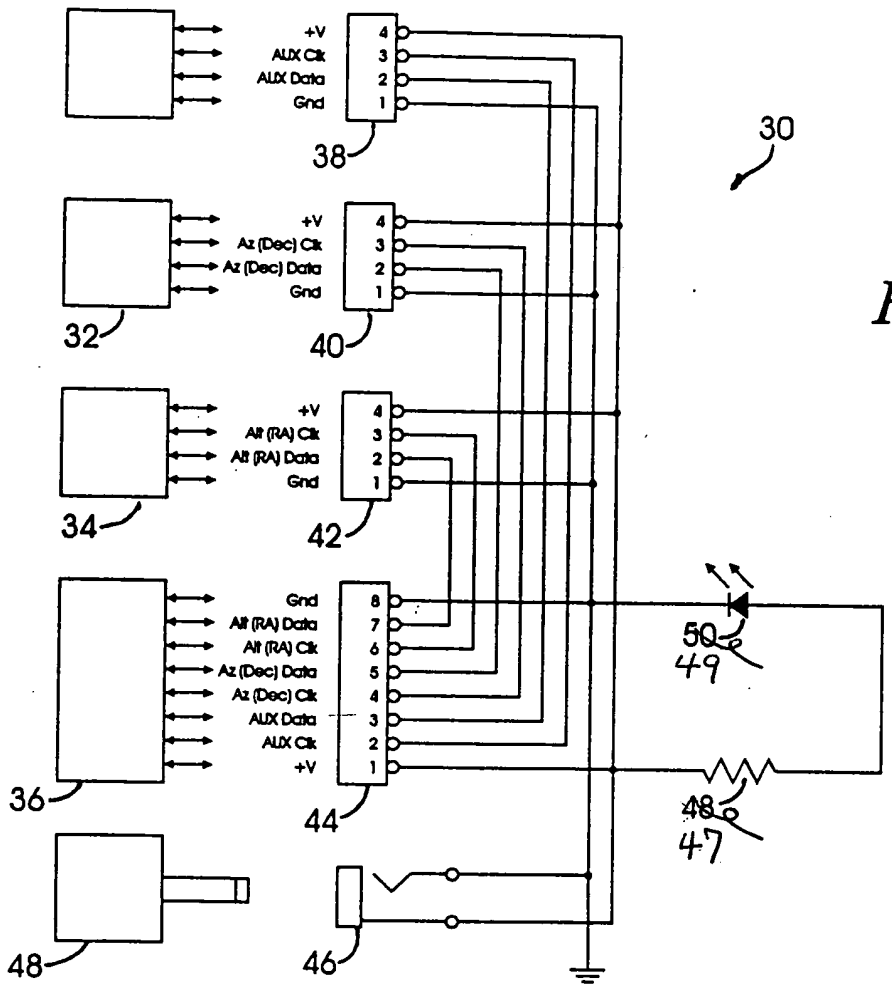

FIG. 3a

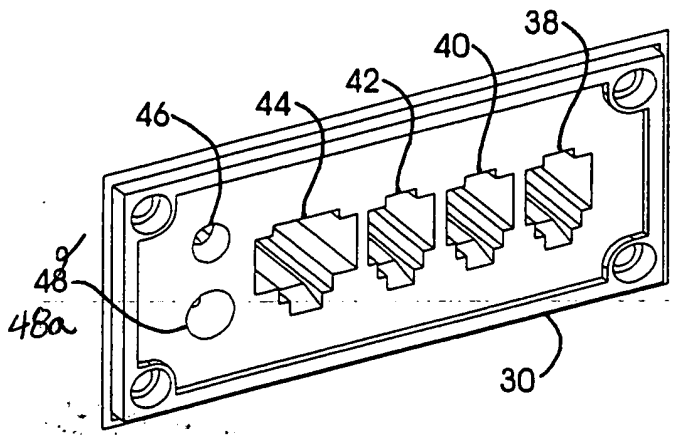

FIG. 3b

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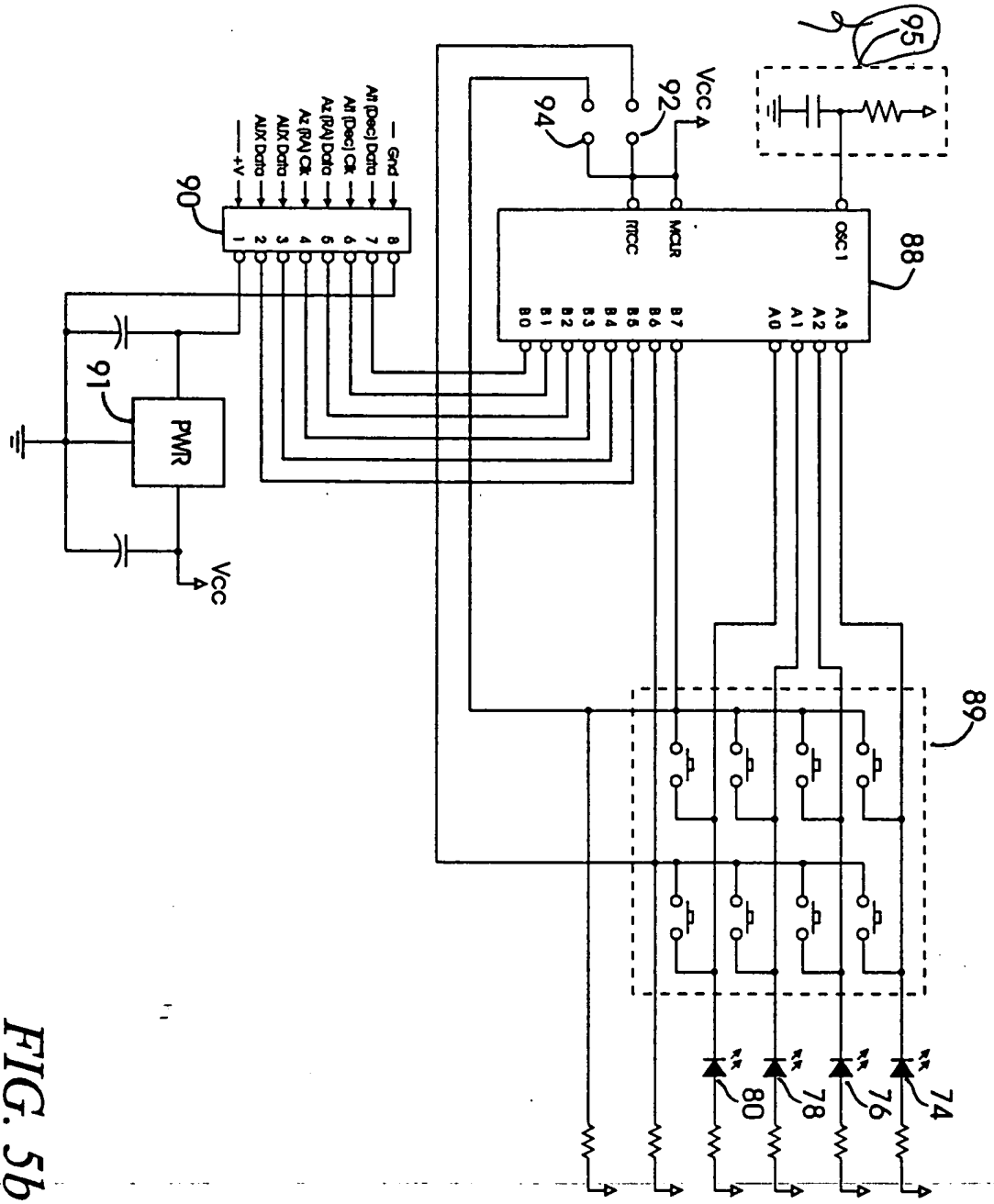

FIG. 5b